CLAIMS

What is claimed is:

1. An overmolded diaphragm pump for applying pumping force to a fluid, comprising:

a rigid substrate having a chamber opening defined therein;

an elastomeric diaphragm and sealing structure fabricated of an elastomeric material, said diaphragm and sealing structure overmolded over at least a portion of the rigid substrate and including at least one diaphragm portion extending over said chamber opening and defining a pump chamber, and a seal portion for making a seal between the elastomeric diaphragm and sealing structure and a mating part.

2. The pump of Claim 1 wherein the diaphragm portion is a dome-like structure.

3. The pump of Claim 1 wherein the diaphragm portion has a rolling convolute configuration, with a central portion and a wall portion joined by a rolling hinge portion.

4. The pump of Claim 1 wherein the diaphragm portion has a central flat portion joined to a collapsible wall portion.

5. The pump of Claim 1 wherein said seal portion comprises an overmolded gland seal portion for mating with a raised boss of the mating part.

6. The pump of Claim 1 wherein the seal portion includes a circular gland.

7. The pump of Claim 1, further comprising a pump actuator for mechanically actuating the elastomeric diaphragm and sealing structure.

8. The pump of Claim 7, wherein said pump actuator includes a motorized cam actuator.

9. The pump of Claim 1, further comprising a bias spring disposed within the chamber for biasing the elastomeric diaphragm portion to a rest position.

10. The pump of Claim 9, further comprising a plate member disposed in said cavity between an end of the spring and the elastomeric diaphragm.

11. The pump of Claim 1, wherein the fluid is liquid ink used in an inkjet printing system.

12. The pump of Claim 1, wherein said elastomeric material is silicone rubber or EPDM rubber.

13. An overmolded diaphragm pump for applying pumping force to a fluid, comprising:

a pump body structure;

a rigid substrate having a chamber opening defined therein;

an elastomeric diaphragm and sealing structure fabricated of an elastomeric material, said diaphragm and sealing structure overmolded over at least a portion of the

rigid substrate and including at least one diaphragm portion extending over said chamber opening and defining a pump chamber, and a seal portion for making a seal between the elastomeric diaphragm and sealing structure and said pump body structure.

14. The pump of Claim 13 wherein the diaphragm portion is a dome-like structure.

15. The pump of Claim 13 wherein the diaphragm portion has a rolling convolute configuration, with a central portion and a wall portion joined by a rolling hinge portion.

16. The pump of Claim 13 wherein the diaphragm portion has a central flat portion joined to a collapsible wall portion.

17. The pump of Claim 13 wherein said seal portion comprises an overmolded gland seal portion for mating with a raised boss of the pump body structure.

18. The pump of Claim 13, wherein the pump body structure includes a chamber surface, said raised boss protruding from the chamber surface.

19. The pump of Claim 18, wherein said raised boss circumscribes a periphery of the pump chamber.

20. The pump of Claim 19, wherein said gland seal portion engages against said chamber surface and an interior surface of said boss.

21. The pump of Claim 13 wherein the seal portion includes a circular gland.

22. The pump of Claim 13, wherein the pump body structure includes a fluid inlet port in fluid communication with said cavity, and a fluid outlet port in fluid communication with said cavity.

23. The pump of Claim 22, further comprising an inlet valve permitting fluid flow into said cavity from the fluid inlet port and preventing fluid flow from said cavity into the fluid inlet port, and an outlet valve permitting fluid flow from said cavity into the outlet port and preventing fluid flow from said outlet port into said cavity.

24. The pump of Claim 23, wherein said inlet valve permits fluid flow into said cavity from the fluid inlet port when an inlet valve break pressure is exceeded, and said outlet valve permits fluid flow from said cavity into the outlet port when an outlet valve break pressure is exceeded.

25. The pump of Claim 13, further comprising a pump actuator for mechanically actuating the elastomeric diaphragm and sealing structure.

26. The pump of Claim 25, wherein said pump actuator includes a motorized cam actuator.

27. The pump of Claim 13, further comprising a bias spring disposed within the chamber for biasing the elastomeric diaphragm portion to a rest position.

28. The pump of Claim 27, further comprising a plate member disposed in said cavity between an end of the spring and the elastomeric diaphragm.

29. The pump of Claim 13, wherein the fluid is liquid ink used in an inkjet printing system.

30. The pump of Claim 13, wherein said elastomeric material is silicone rubber or EPDM rubber.

31. A multi-chambered overmolded diaphragm pump system for applying pumping force to a fluid, comprising:

a rigid substrate having a plurality of chamber openings;

an elastomeric diaphragm and sealing structure fabricated of an elastomeric material, said diaphragm and sealing structure overmolded over at least a portion of the rigid substrate and including a corresponding plurality of diaphragm portions each extending over a corresponding one of said plurality of chamber openings and a plurality of seal portions each for making a seal between the elastomeric diaphragm and sealing structure and a mating part.

32. The pump system of Claim 31 wherein each said seal portion comprises an overmolded gland seal portion.

33. A multi-chambered overmolded diaphragm pump system for applying pumping force to a fluid, comprising:

a pump body structure including a plurality of sets of inlet and outlet chamber valves, each set for a corresponding pump chamber;

a plurality of diaphragm chamber structures, each including:

a rigid substrate having a chamber opening defined therein;

an elastomeric diaphragm and sealing structure fabricated of an elastomeric material, said diaphragm and sealing structure overmolded over at least a portion of the rigid substrate and including a diaphragm portion and a seal portion for making a seal between the elastomeric diaphragm and sealing structure and a surface of said pump body structure; and

wherein each of said plurality of diaphragm chamber structures is assembled to said pump body structure with a sealing fit between each said surface and each said seal portion.

34. The pump system of Claim 33 wherein said body structure comprises a plurality of raised bosses circumscribing the pump chambers, and each of said seal portion comprises an overmolded gland seal portion for mating with a corresponding one of said plurality of raised bosses.

35. The pump of Claim 33 wherein the seal portion includes a plurality of circular glands each for press fitting into a corresponding channel formed on a mating part.

36. A diaphragm pump system for pumping a fluid, comprising:

a pump body structure including a fluid inlet, a fluid outlet, a fluid inlet valve and a fluid outlet valve, the

pump body structure including a wall circumscribing a pump chamber periphery;

a rigid substrate having an opening defined therein;

an elastomeric diaphragm and sealing structure fabricated of an elastomeric material, said diaphragm and sealing structure overmolded over at least a portion of the rigid substrate and including at least one diaphragm portion extending over said chamber opening and defining a collapsible pump chamber wall, and a seal portion for making a seal between the elastomeric diaphragm and sealing structure and said wall of said pump body structure; and

a pump actuator for contacting the pump chamber wall to collapse the wall.

37. The pump of Claim 36 wherein said seal portion comprises an overmolded gland seal portion for mating with said wall of said body structure.